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(54) **METHODS AND APPARATUS FOR SUBSCRIBING TO MULTIMEDIA DELIVERY SERVICES IN A DATA NETWORK**

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H04L 29/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 67/20*** (2013.01); ***H04L 67/04*** (2013.01); ***H04L 67/2833*** (2013.01); ***H04L 67/30*** (2013.01); ***H04L 67/306*** (2013.01); *H04L 67/303* (2013.01)

(58) **Field of Classification Search**
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USPC 455/414.2; 379/88.13; 718/104
See application file for complete search history.

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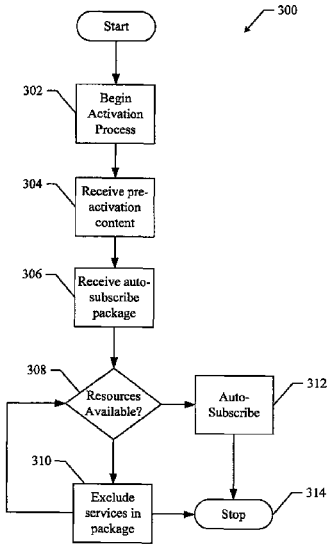
(57) **ABSTRACT**

Methods and apparatus for subscribing to multimedia delivery services in a data network. A method is provided for subscribing to receive a subscription package in a data network. The method includes receiving resource requirements associated with the subscription package, and determining whether or not selected resources are available to meet the resource requirements associated with the subscription package. The method also includes excluding a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and subscribing to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

24 Claims, 7 Drawing Sheets



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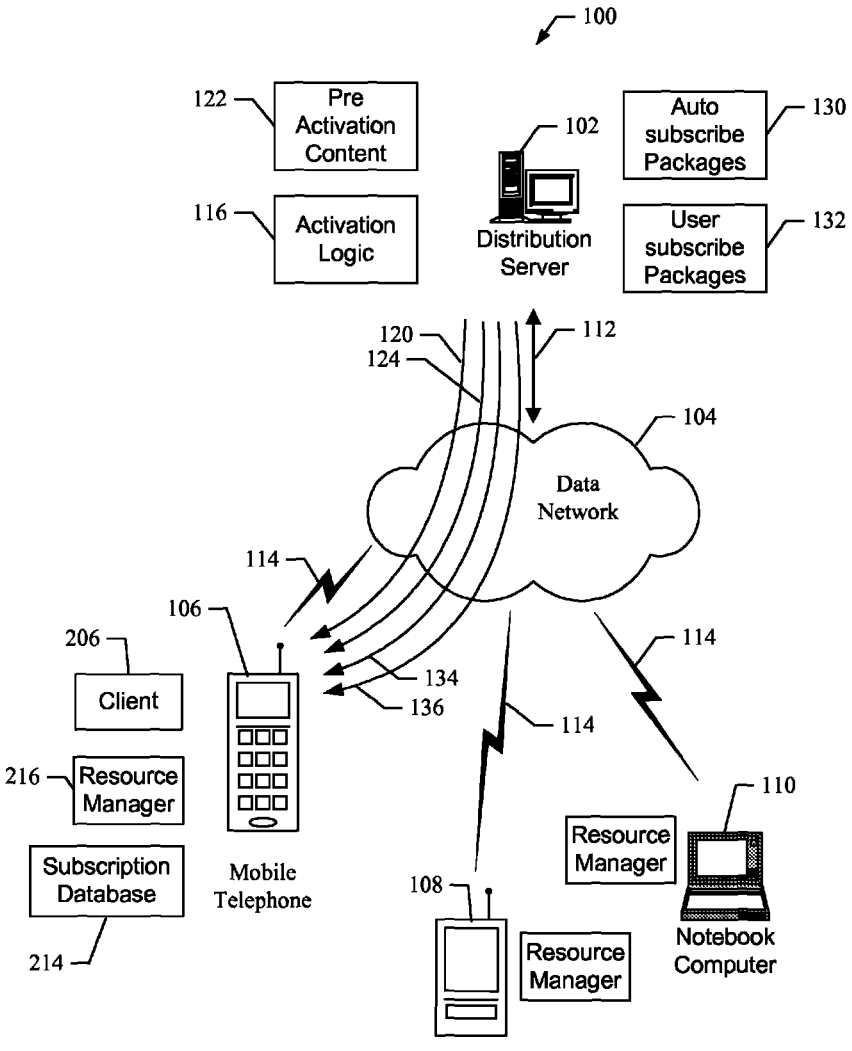
100
122
Pre Activation Content
116
Activation Logic
102
Distribution Server
Auto subscribe Packages
130
User subscribe Packages
132
120
124
112
104
Data Network
114
106
206
Client
216
Resource Manager
Subscription Database
214
Mobile Telephone
134
136
114
114
110
Resource Manager
Notebook Computer
108
Resource Manager
PDA

FIG. 1

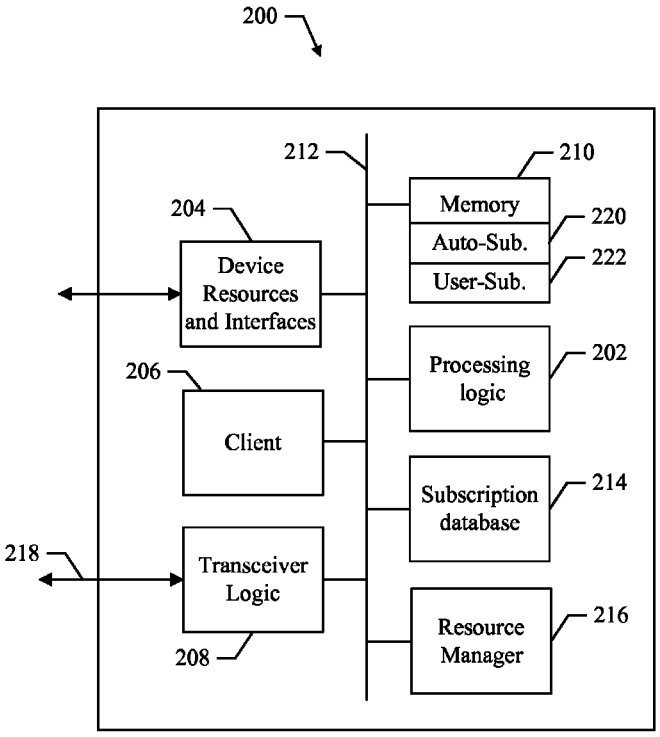
200
212
210
Memory
220
Auto-Sub.
222
User-Sub.
204
Device Resources and Interfaces
206
Client
Processing logic
202
Subscription database
214
218
Transceiver Logic
208
Resource Manager
216

FIG. 2

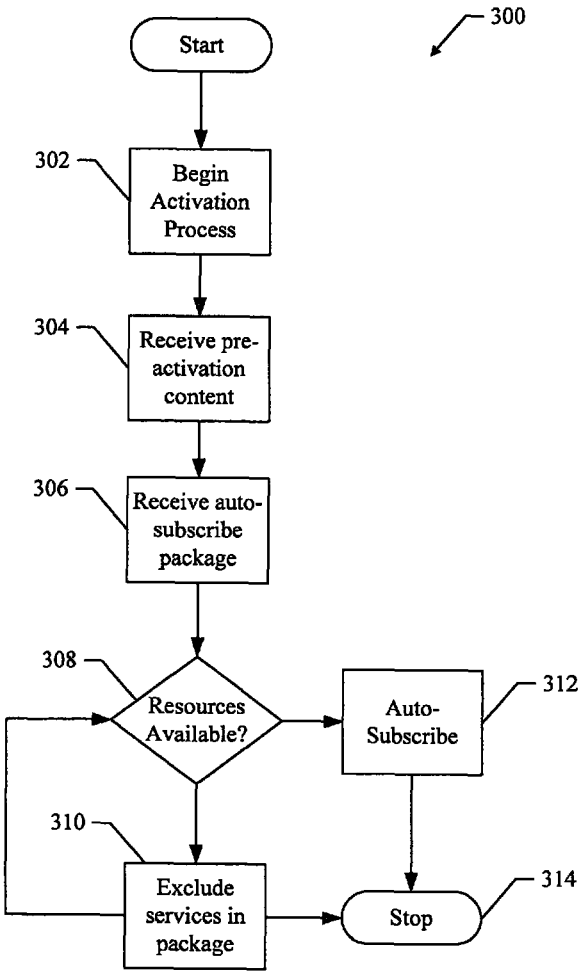
300
Start
302
Begin Activation Process
304
Receive pre-activation content
306
Receive auto-subscribe package
308
Resources Available?
312
Auto-Subscribe
310
Exclude services in package
314
Stop

FIG. 3

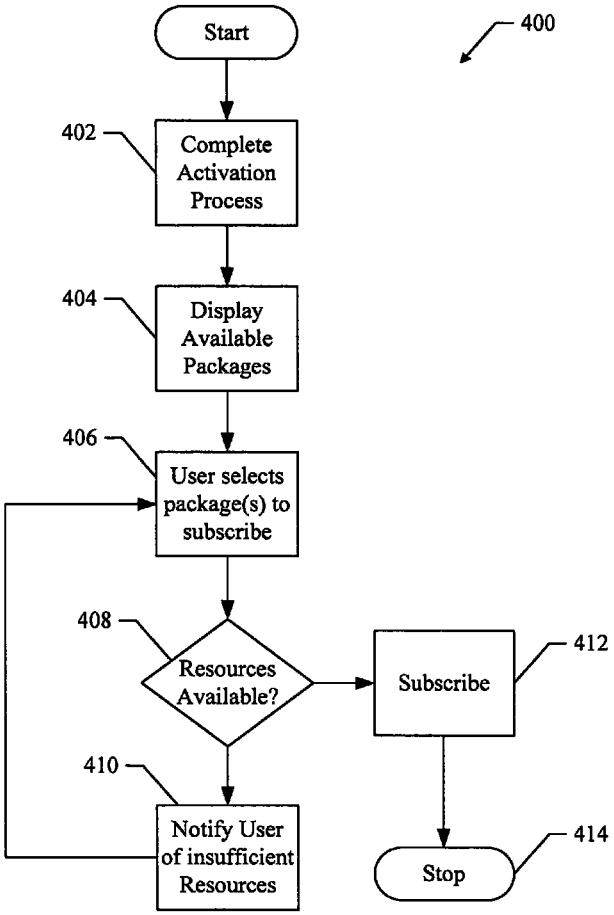
Start
400
402
Complete Activation Process
404
Display Available Packages
406
User selects package(s) to subscribe
408
Resources Available?
412
Subscribe
410
Notify User of insufficient Resources
414
Stop

FIG. 4

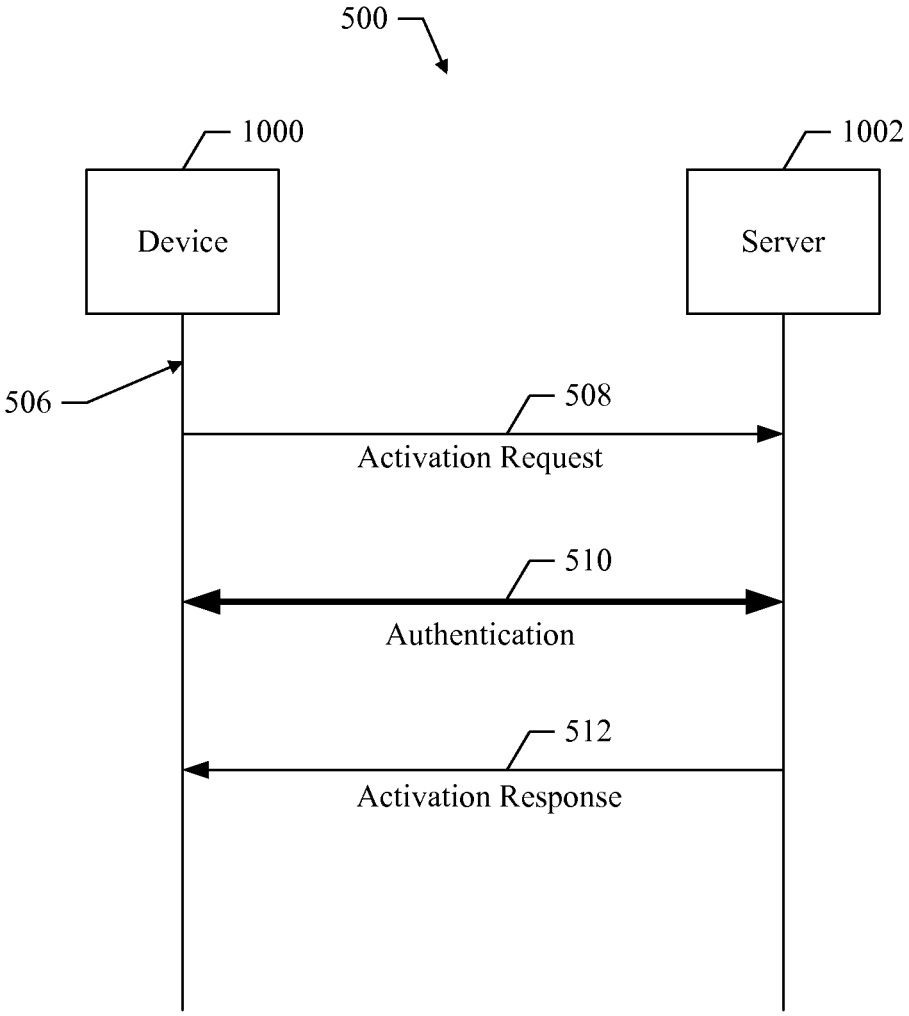
500
1000
Device
1002
Server
506
508
Activation Request
510
Authentication
512
Activation Response

FIG. 5

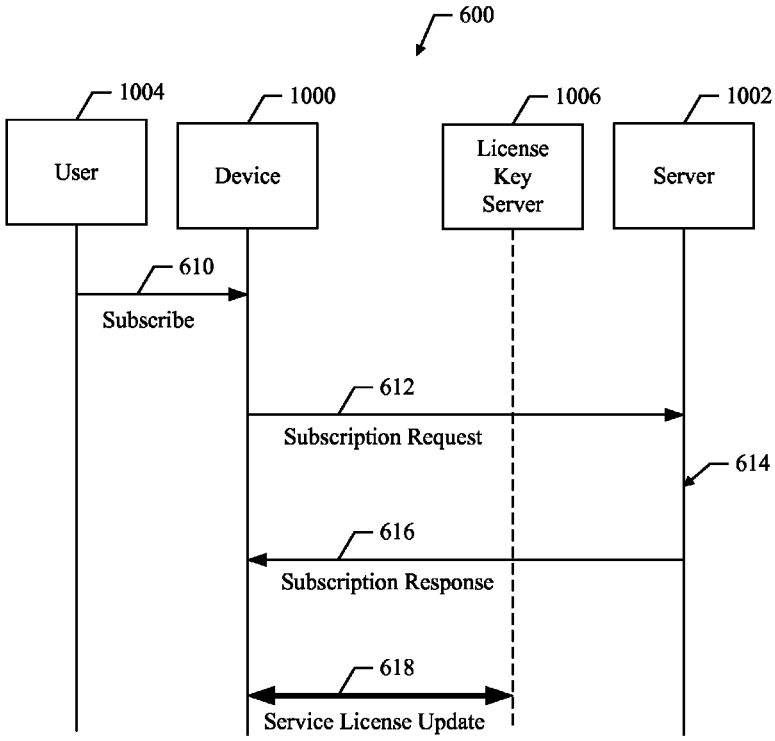
600
1004
1000
1006
1002
User
Device
License Key Server
Server
610
Subscribe
612
Subscription Request
614
616
Subscription Response
618
Service License Update

FIG. 6

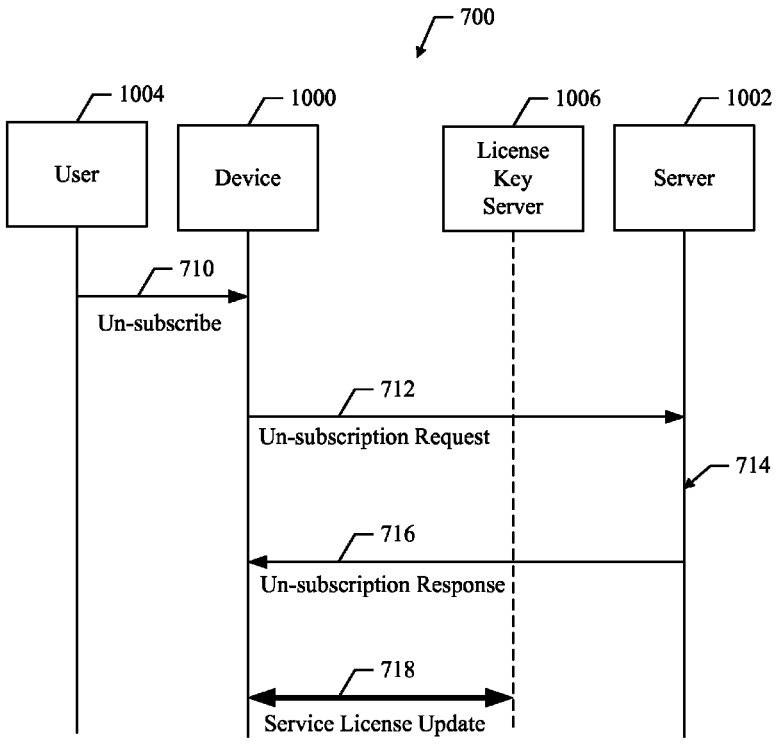
700
1004
1000
1006
1002
User
Device
License Key Server
Server
710
Un-subscribe
712
Un-subscription Request
714
716
Un-subscription Response
718
Service License Update

FIG. 7

METHODS AND APPARATUS FOR SUBSCRIBING TO MULTIMEDIA DELIVERY SERVICES IN A DATA NETWORK

CLAIM OF PRIORITY UNDER 35 U.S.C. §119

The present Application for Patent claims priority to Provisional Application No. 60/592,481 entitled "METHOD AND APPARATUS FOR A DEVICE TO ACTIVATE AND SUBSCRIBE TO A MULTIMEDIA DELIVERY SERVICE IN A MOBILE RADIO COMMUNICATION SYSTEM" filed Jul. 30, 2004, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

BACKGROUND

1. Field

Embodiments of the invention relate generally to the operation of content distribution systems, and more particularly, to methods and apparatus for subscribing to multimedia delivery services in a data network.

2. Background

The distribution of services (data and/or other multimedia content) to a large number of devices is a complicated problem. This is especially true for mobile devices that communicate using relatively slow over-the-air communication links and which may have one or more resource limitations, such as limited memory resources. Therefore, it is very important for network administrators and service providers to have a way that allows mobile devices to easily and efficiently subscribe to receive content and/or other network services that will operate on such resource limited devices.

In current content delivery/media distribution systems, subscriptions are typically handled over the Internet via one or more customer sign-up pages, or as in traditional cable and satellite systems, via a telephone call made by the customer to a customer service representative. The sign-up page model may even offer one or more pages that are specifically formatted (i.e., WML, XHTML) for presentation on a mobile device. For example, a device user first needs to launch a data session with a service provider in order to view the service offerings. After selecting an offering for subscription, the user needs to complete one or more forms that are downloaded from the server and rendered on the device. Generally, because the forms are formatted for rendering on the relatively small screen available on the portable device, multiple forms need to be completed. Furthermore, because the entire process is conducted over-the-air, the relatively low transmission speeds make the subscription process very slow. Unfortunately, this approach is essentially just a variation of the Internet sign-up page model and is generally tedious and inefficient when used in conjunction with resource limited portable devices.

Furthermore, current systems offer service packages to a wide range of devices without accounting for the resources available at each device. For example, services that require large amounts of memory are offered to devices with limited memory resources. As a result, the services may not operate properly at the device and may even damage the operation of the device with respect to other services or functions.

Therefore, what is needed is a subscription system that allows a device to easily subscribe to one or more service packages. The system should also operate to prevent the device from subscribing to services that cannot be accommodated by the available resources at the device.

SUMMARY

In one or more embodiments, a subscription system is provided that allows a device to subscribe to multimedia delivery services in a data network. In one embodiment, the system comprises a resource management system that operates to control the subscription process based on the resources available at a device.

In one embodiment, a method is provided for subscribing to receive a subscription package in a data network. The method comprises receiving resource requirements associated with the subscription package, and determining whether or not selected resources are available to meet the resource requirements associated with the subscription package. The method also comprises excluding a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and subscribing to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

In one embodiment, an apparatus is provided for subscribing to receive a subscription package in a data network. The apparatus comprises logic configured to receive resource requirements associated with the subscription package, and logic configured to determine whether or not selected resources are available to meet the resource requirements associated with the subscription package. The apparatus also comprises logic configured to exclude a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and logic configured to subscribe to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

In one embodiment, an apparatus is provided for subscribing to receive a subscription package in a data network. The apparatus comprises means for receiving resource requirements associated with the subscription package, and means for determining whether or not selected resources are available to meet the resource requirements associated with the subscription package. The apparatus also comprises means for excluding a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and means for subscribing to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

In one embodiment, a computer-readable media is provided that comprises instructions, which when executed by a processor, operate to subscribe to receive a subscription package in a data network. The computer-readable media comprises instructions for receiving resource requirements associated with the subscription package, and instructions for determining whether or not selected resources are available to meet the resource requirements associated with the subscription package. The computer-readable media also comprises instructions for excluding a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and instructions for subscribing to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

In one embodiment, at least one processor is provided that is configured to implement a method for subscribing to receive a subscription package in a data network. The method

comprises receiving resource requirements associated with the subscription package, and determining whether or not selected resources are available to meet the resource requirements associated with the subscription package. The method also comprises excluding a first portion of services associated with the subscription package, if it is determined that the selected resources fail to meet the resource requirements associated with the subscription package, and subscribing to receive a second portion of services associated with the subscription package, wherein resource requirements of the second portion of services are met by the selected resources.

Other aspects of the embodiments will become apparent after review of the hereinafter set forth Brief Description of the Drawings, Detailed Description, and the Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects of the embodiments described herein will become more readily apparent by reference to the following detailed description when taken in conjunction with the accompanying drawings wherein:

FIG. **1** shows a network that comprises one embodiment of a subscription system;

FIG. **2** shows a detailed diagram of one embodiment of a device suitable for use in one embodiment of a subscription system;

FIG. **3** shows one embodiment of a method for operating a device in one embodiment of a subscription system;

FIG. **4** shows one embodiment of a method for operating a device in one embodiment of a subscription system;

FIG. **5** shows one embodiment of a message flow diagram that illustrates how a device activation is provided in one embodiment of a subscription system;

FIG. **6** shows one embodiment of a message flow diagram that illustrates how a device subscription process is provided in one embodiment of a subscription system; and

FIG. **7** shows one embodiment of a message flow diagram that illustrates how a device subscription is changed in one embodiment of a subscription system.

DETAILED DESCRIPTION

In one or more embodiments, a subscription system is provided that allows a device to subscribe (and unsubscribe) to multimedia delivery services in a data network. The system is especially well suited for use in wireless network environments, but may be used in any type of wireless and/or wired network environment, including but not limited to, communication networks, public networks, such as the Internet, private networks, such as virtual private networks (VPN), local area networks, wide area networks, long haul networks, or any other type of data network.

The following definitions are used herein to describe one or more embodiments of a subscription system.

Service A service is a sequence of media presentations and represents the smallest element that may be subscribed to in the subscription system. In one embodiment, a service comprises one or more multimedia clips that are delivered to a device for real-time playback or stored at the device for later playback.

Package A package (or "subscription package") is a collection of one or more services that are offered on a subscription basis.

FIG. **1** shows a network **100** that comprises one embodiment of a subscription system. The network **100** comprises a distribution server **102**, a data network **104**, and a collection of devices that comprise a mobile telephone **106**, a personal digital assistant (PDA) **108**, and a notebook computer **110**. The data network **104** may be any type and/or combination of wired and/or wireless networks that allow data to be transmitted between the server **102** and the devices. The server **102** communicates with the network **104** via the communication link **112**, which may comprise any type of wired or wireless communication channel. The data network **104** provides wireless communication links **114** that allow data to be wirelessly transmitted between the network **104** and the devices **106**, **108**, and **110**. The wireless communication links **114** comprise any type of wireless communication technology. For the remainder of this description, embodiments of the subscription system will be described with reference to the mobile telephone **106**. However, the embodiments are equally applicable to the devices **108** and **110** as well.

In one embodiment, an activation process is performed. The activation process registers a device with the distribution server **102**, which allows the device to subscribe to receive available services in the form of subscription packages. For example, each subscription package includes selected services that a device may subscribe to receive. The device **106** communicates with activation logic **116** at the server **102** to perform the activation process. As part of the activation process, a client **206** is installed on the device. In one embodiment, the client **206** is downloaded to the device **106** from the distribution server **102**, as shown by path **120**. In another embodiment, the device manufacturer installs the client **206** on the device **106** during device manufacture.

In one embodiment, the activation process may take a few minutes to complete. For example, during the activation process the client **206** establishes a packet data session, generates an encryption and decryption key pair, downloads system information, and downloads the latest program guide, which describes the available subscription packages. While the activation process is taking place in the background, the distribution server **102** delivers pre-activation content **122** to the device **106** in the form of a video resource file, as shown by path **124**. When rendered on the device **106**, the pre-activation content **122** provides the user with a preview of the subscription packages available from the distribution server **102**. In one embodiment, the pre-activation content **122** is stored on the device **106** during manufacture and rendered during the activation process.

The device **106** comprises a resource manager **216** that operates to manage the resources of the device **106**. For example, the device resources comprise memory resources, video resources, user input resources, sound resources, communication resources, positioning resources, or any other type of device resource. In one embodiment, the resource manager **214** operates to manage the device resources so that the device **106** will not be allowed to subscribe to service packages that cannot be accommodated by the available resources. For example, because the device **106** is a portable device, the amount of memory resources may be limited. The resource manager **216** operates to manage the limited memory resources so that the device **106** will not be allowed to subscribe to service packages that will not fit into the available memory.

The device **106** also comprises a subscription database **214** that describes service packages to which the device **106** has subscribed. For example, during the activation process, the device may be automatically subscribed to one or more service packages. Furthermore, after the activation process, the user may initiate the subscription of the device to one or more service packages. The subscription database **214** maintains information about all the services to which the device has subscribed. For example, the subscription database **214**

includes information pertaining to the type, size, cost, delivery schedule, resource utilization, or any other information relating to the subscribed services. In one embodiment, the resource manager **216** uses the subscription database **214** to determine what resources are allocated to existing subscriptions and how much of the device's resources are still available for new subscriptions.

The resource manager **216** operates to manage device resources for subscription packages that are automatically subscribed to the device. For example, in one embodiment, the server **102** comprises auto-subscribe packages **130** that are automatically subscribed to the device during the activation process, or as the result of some other device interaction with the server **102**. The resource manager **216** determines if there are enough resources at the device **106** to accommodate all the services in an auto-subscribe package. For example, the resource manager determines if all the services included in an auto-subscribe package will fit into the portion of the device's memory that is allocated for auto-subscription. If the resource manager **216** determines that the resources are available (i.e., the auto-subscribe package will fit into the available allocated memory), then the resource manager operates to reserve the device's resources necessary to accommodate the auto-subscribe package. Once the device resources have been reserved, the auto-subscription process continues. For example, the auto-subscribe packages **130** are delivered to the device **106** as shown by path **134**.

If the resource manager **216** determines that the available device resources cannot accommodate all the services in the auto-subscribe package, then the resource manager **216** operates to automatically exclude selected services until the remaining services in the auto-subscribe package can be accommodated. For example, services within the auto-subscribe package are ranked (or prioritized based on any selectable characteristic) and the lower ranked services are excluded until the resource requirements of the auto-subscribe package is reduced enough that the device resources can accommodate the remaining services in the auto-subscribe package. For example, services in the auto-subscribe package are excluded until the remaining services can fit into the available memory. When enough services have been excluded, the resource manager **216** reserves the necessary device resources and the auto-subscription process continues. As a result, the device **106** is automatically subscribed to the remaining services in the auto-subscribe package.

In another embodiment, the resource manager **216** operates to manage package subscriptions initiated by the user of the device **106**. For example, the server **102** comprises user-subscribe packages **132** that are subscribed to the device at the request of the device user, and delivered to the device **106** as shown by path **136**. The client **206** displays a list of available service packages to the user of the device **106**. The user then selects one or more service packages for subscription. The resource manager **216** operates to verify that the available device resources can accommodate the services offered in the selected packages (i.e., the services will fit into the available memory of the device). If the selected packages can be accommodated, the resource manager **216** reserves the required resources and allows the subscription process to continue. If the selected packages cannot be accommodated, the resource manager **216** notifies the device user and requests adjustments to the subscription selections. The device user may then exclude one or more services from the selected subscription packages to reduce or eliminate resource requirements. Once the resource manager **216** determines that the available device resources can accommodate the services in the selected subscription packages, those resources are reserved and the subscription process continues.

It should be noted that the resource manager **216** operates to manage any device resource. For example, if a particular subscription package comprises selected services that require specialized hardware that the device does not have (i.e., video logic or positioning logic), then the resource manager **216** operates to automatically exclude (or allows the user to exclude) those services from installation on the device.

In one embodiment, the subscription system also operates to unsubscribe services from a device. For example, in one embodiment, the client **206** provides a list of currently subscribed services to the device user. The device user selects one or more services from the list to be unsubscribed. The client **206** operates to notify the distribution server **102** that selected services are to be unsubscribed from the device. In addition, the client **206** notifies the resource manager **216** so that the resources allocated to the unsubscribed services can be freed up for re-allocation to other services. The subscription database **214** is also updated to reflect that selected services have been unsubscribed from the device.

In one embodiment, the client **206** is operational at the device for a selected grace period (i.e., 30 days). For example, when the device is activated, the client **206** operates to provide auto-subscriptions or user initiated subscriptions to the device. If no subscriptions are provided to the device during the grace period, (i.e., no subscription packages are purchased), then the client **206** enters into a sleep mode and is no longer operational on the device. If, in the future, the user attempts to activate the device with the distribution server **102**, the client **206** will return to its operational mode from its sleep mode to provide subscriptions as described herein.

Thus, in one or more embodiments, a subscription system is provided that operates to allow a device to subscribe to all or portions of available subscription packages based on the resources available at the device.

FIG. **2** shows one embodiment of a device **200** suitable for use in one embodiment of a subscription system. The device **200** comprises processing logic **202**, device resources and interfaces **204**, transceiver logic **208**, and memory **210** all coupled to a data bus **212**. The device **200** also comprises a client **206**, a subscription database **214**, and a resource manager **216**, which are also coupled to the data bus **212**.

In one or more embodiments, the processing logic **202** comprises a CPU, processor, gate array, hardware logic, memory elements, virtual machine, software, and/or any combination of hardware and software. Thus, the processing logic **202** generally comprises logic to execute machine-readable instructions and to control one or more other functional elements of the device **200** via the internal data bus **212**.

The device resources and interfaces **202** comprise hardware and/or software that allow the device **200** to communicate with internal and external systems. For example, internal systems may include mass storage systems, memory, display driver, modem, positioning logic, or other internal device resources. The external systems may include user interface devices, displays, keyboards, printers, disk drives, or other local devices or systems.

The memory **210** comprises RAM, ROM, Flash and/or any other suitable memory storage device. In one embodiment, the memory **210** comprises a memory portion **220** allocated for auto-subscribed packages, and a memory portion **222** allocated for user-subscribed packages. The processing logic **202** operates to configure the memory **210** and to allocate the memory portions **220** and **222**.

The transceiver logic **208** comprises hardware configured, for example with software, so as to allow the device **200** to transmit and receive data other information with external devices or systems using communication channel **218**. For example the communication channel **218** may comprise a wireless and/or wired network communication link or any other type of communication link.

During operation, the device **200** is activated with a distribution server to subscribe to available subscription packages according to one or more embodiments of a subscription system. As part of the activation process, the device **200** reserves memory to satisfy an activation memory requirement, which specifies the minimum amount of memory required to store information about the available services and packages. The activation memory requirement imposes only a minimum demand on the available memory resources needed to activate the device **200**. This limited storage requirement allows the user to activate the device **200** with the distribution system and browse a program guide that describes the packages and/or services available for subscription without having to make any additional storage allocation decisions.

In one embodiment, the client **206** is downloaded from the distribution server through the transceiver logic **208** using the channel **218**. The client **206** comprises any suitable type of hardware/software that executes on the device **200** and communicates with the distribution server through the transceiver logic **208** to complete the activation process. In another embodiment, the client **206** is installed on the device **200** during device manufacture, or may be downloaded from a third party. After activation, the client **206** operates on the device **200** to provide a user interface that displays information to the device user about available subscription packages, or operates to receive various user input.

The resource manager **216** comprises any combination of hardware and software, and operates to verify that available resources exist on the device to accommodate any package that is subscribed to during the subscription process. For example, if a selected auto-subscribe package requires a selected amount of memory, the resource manager **216** operates to determine the memory requirements of the package and verify that enough memory is available at the memory portion **220** before the device subscribes to the package.

The subscription database **212** comprises any type of memory or storage logic suitable for storing information relating to packages/services to which the device **200** has subscribed. For example, the subscription database **212** may comprise package identifiers, service identifiers, size characteristics, resource identifiers, resource allocation requirements, scheduling information, pricing, and/or any other information about the subscription packages to which the device **200** has subscribed.

As part of the activation process, the client **206** operates to receive one or more auto-subscribe packages from the distribution server. An auto-subscribe package comprises services that are to be automatically subscribed to the device **200**. In one embodiment, the services are ranked or prioritized based on any selectable characteristic. The resource manager **216** operates to determine if there are enough device resources (i.e., memory) available to allow auto-subscription of an auto-subscribe package to occur. If there are enough resources, then the resource manager **216** reserves the resources and the auto-subscription process proceeds. If there are not enough resources, then the resource manager **216** operates to automatically exclude selected services from the auto-subscribe package based on their ranking. Once enough of the services are excluded so that the available device resources can accommodate the remaining services in the auto-subscribe package, the resource manager **216** reserves those resources and the auto-subscription process is allowed to continue.

Once the activation process is complete, the client **206** operates to provide a user interface (UI) that allows the device user to view the available service packages. The client **206** also allows the device user to select one or more packages for subscription. After the device user selects a package for subscription, the resource manager **216** operates to determine if the available device resources can accommodate the selected package (i.e., will the selected package fit into the user-subscribe memory portion **222**). If the device resources can accommodate the selected package, the resource manager **216** operates to reserve the required resources and the user initiated subscription process continues. If the selected package cannot be accommodated, the resource manager **216** notifies the user that there are not enough resources to support the selected package. The user may then select to exclude services in the package, or may select a different subscription package to reduce the device resource requirements so that subscription may occur.

The device **200** performs one or more of the following functions in one or more embodiments of a subscription system. It should be noted that the following functions may be changed, rearranged, modified, added to, or otherwise adjusted within the scope of the embodiments.

1. The device activates with a distribution system.
2. An installed client attempts to auto-subscribe one or more packages.
3. The resource manager controls the auto-subscription process so that only packages that can be accommodated by the available resources will be auto-subscribed. Services within the packages are excluded by ranking if necessary.
4. The client displays a list of available packages to the user.
5. The user selects one or more packages to which the device is to be subscribed.
6. The resource manager controls the user-initiated subscription process so that only packages that can be accommodated by the available resources will be subscribed. Packages or services within the packages are excluded by the user if necessary.

In one embodiment, the subscription system comprises program instructions stored on a computer-readable media, which when executed by a processor, such as the processing logic **202**, provides the functions of the subscription system described herein. For example, instructions may be loaded into the device **200** from a computer-readable media, such as a floppy disk, CDROM, memory card, FLASH memory device, RAM, ROM, or any other type of memory device or computer-readable media that interfaces to the device **200** through the device resources **204**. In another embodiment, the instructions may be downloaded into the device **200** from a network resource that interfaces to the device **200** through the transceiver logic **208**. The instructions, when executed by the processing logic **202**, provide one or more embodiments of a subscription system as described herein.

FIG. **3** shows one embodiment of a method **300** for operating a device in one or more embodiments of a subscription system. For clarity, the method **300** will be described with reference to the device **200** shown in FIG. **2**. In one or more embodiments, the processing logic **202** executes program instructions to control the device **200** to perform the functions described below.

At block **302**, an activation process is performed to activate a device with a distribution server to allow the device to subscribe to available packages. In one embodiment, the processing logic **202** communicates with the distribution server

through the transceiver logic **208** and communication channel **218** to provide information for the activation process. During the activation process, the client **206** is installed and executes on the device.

At block **304**, the device receives and renders pre-activation content. For example, because the activation process may take a few minutes to complete, the distribution server transmits pre-activation content to the device that is received by the transceiver logic **208** and passed to the device resources and interfaces **204** for rendering on the device during the activation process. In another embodiment, the pre-activation content is stored at the device during device manufacture and rendered during the activation process.

At block **306**, the device receives one or more auto-subscribe packages. For example, the transceiver **208** receives an auto-subscribe package from the distribution server for installation on the device. In one embodiment, the transceiver **208** passes the auto-subscribe package to the client **206**, which processes the auto-subscribe package to determine its resource requirements and any other information necessary to install the package on the device.

At block **308**, a test is performed to determine if there are enough resources available at the device to install the auto-subscribe package. For example, the resource manager **216** receives information about the resource requirements of the auto-subscribe package from the client **206**. The resource manager **216** also receives information about the available device resources from the subscription database **214**. For example, the subscription database **214** comprises information about packages already subscribed to by the device. The resource manager **216** uses this information to determine if there are enough resources available at the device to install the auto-subscribe package. For example, the resource manager **216** uses the information from the subscription database to determine if there is enough memory at the memory portion **220** to install the auto-subscribe package. If there are enough resources (i.e., memory), the resource manager reserves the resources and the method proceeds to block **312**. If there are not enough resources, the method proceeds to block **310**.

At block **310**, selected services in the auto-subscribe package are automatically excluded from the installation. For example, in one embodiment, the auto-subscribe package comprises multiple services that are ranked by priority. The resource manager **216** operates to automatically exclude selected services based on the priority. For example, starting from the lowest priority, the resource manager **216** excludes a first portion of the services until the available device resources can accommodate the remaining services (second portion of services). It should be noted that the resource manager **216** may use any technique or information to automatically exclude a portion of services from the auto-subscribe package. For example, services may be excluded based on priority, size, date, resource requirements, licensing requirements, price, or any other information or resource characteristic. The method then proceeds to block **308** where the resource requirements of the remaining servicesin the auto-subscribe package are tested. If there are no more remaining services after the automatic exclusion process is performed at block **310**, the method proceeds to block **314**.

At block **312**, the auto-subscribe services that can be accommodated by the device resources will be installed on the device. For example, in one embodiment, the client **206** installs the auto-subscribe services into the memory portion **220**, and updates the subscription database **214** to indicate that the memory portion **220** now includes selected services from the auto-subscribe package. The method then ends at block **314**.

Thus, the method **300** provides one embodiment of a subscription system that operates to allow a device to subscribe to one or more auto-subscribe packages. It should be noted that the method **300** illustrates just one implementation and that changes, additions, or rearrangements of the functional elements may be made without deviating from the scope of the described embodiments.

FIG. **4** shows one embodiment of a method **400** for operating a device in one or more embodiments of a subscription system. For clarity, the method **400** will be described with reference to the device **200** shown in FIG. **2**. In one or more embodiments, the processing logic **202** executes program instructions to control the device **200** to perform the functions described below.

At block **402**, an activation process is completed to activate a device with a distribution server to allow the device to subscribe to available packages. In one embodiment, the processing logic **202** communicates with the distribution server through the transceiver logic **208** and communication channel **218** to complete the activation process. During the activation process, the client **206** is installed and executes on the device. In one embodiment, one or more auto-subscribe packages are installed at the device during the activation process. For example, the method **300** described how in one embodiment, auto-subscribe packages are installed on the device **200**.

At block **404**, a list of available packages is displayed to the device user. In one embodiment, the client **206** displays on a device display a list of packages available for subscription. For example, the list of packages is part of a program guide installed on the device during the activation process.

At block **406**, a device user selects one or more packages for subscription. In one embodiment, the user has the option to select some services within a package for subscription, and to exclude other services from subscription. For example, the user may exclude a first portion of services within a package and thereby subscribe to a second portion of services (i.e., the remaining un-excluded services in the package).

At block **408**, a test is performed to determine if there are enough resources available at the device to install the selected packages. For example, the resource manager **216** receives information about the resource requirements of the selected packages from the client **206**. The resource manager **216** also receives information about the available device resources from the subscription database **214**. The subscription database **214** comprises information about packages already subscribed to by the device. The resource manager **216** uses this information and any other system information as necessary to determine if there are enough available resources at the device to install the selected packages. For example, the resource manager **216** uses the information from the subscription database **214** to determine if there is enough free memory at the memory portion **222** to install the selected packages.

The resource manager **216** may also determine if there are other types of resources available for allocation to the selected packages. For example, the resource manager **216** may obtain any other type of system information to determine if there are available hardware resources, such as a modem, positioning logic, high resolution video display, graphics processor, or any other type of hardware resource. The resource manager **216** may also determine if there are available software resources, such as a particular version of a software module, or a particular type of software driver. If there are enough available resources (i.e., memory, hardware, or software), the resource manager **216** reserves the resources as necessary and the method proceeds to block **412**. If there are not enough available resources, the method proceeds to block **410**.

At block **410**, the user is notified about the insufficient resources available at the device to install the selected packages. For example, in one embodiment, the resource manager **216** notifies the user via a display resource associated with the device resources and interfaces **204**. The notification comprises information about the selected packages, required resources, available resources, and any other relevant information. The method then proceeds to block **406** where the device user has the opportunity to change or modify the package selections.

At block **412**, the services in the user selected packages that can be accommodated by the device resources will be installed on the device. For example, in one embodiment, the resource manager **216** indicates to the client **206** that resources for the selected packages have been reserved. The client **206** then installs the services into the memory portion **222**, and updates the subscription database **214** to indicate that the memory portion **222** now includes services from the user-selected packages. The client **206** also sets up or initializes any other hardware or software device resources and communicates with the distribution server as necessary to complete the subscription of the selected packages. The method then ends at block **414**.

Thus, the method **400** provides one embodiment of a subscription system that operates to allow a device user to select and subscribe to one or more subscription packages. It should be noted that the method **400** illustrates just one implementation and that changes, additions, or rearrangements of the functional elements may be made without deviating from the scope of the described embodiments.

Message Flows

The following information describes the flow of messages between a device and a distribution server in one embodiment of a subscription system. The described message flows occur during device activation, package subscription, and subscription modification.

Device Activation

FIG. **5** shows one embodiment of a message flow diagram **500** that illustrates how a device activation process is provided in one embodiment of a subscription system. The activation process sets a device to a state that allows it to subscribe to available service packages. In one embodiment, the client **206** performs the activation process upon launch of a system application. During the activation process the following messages are exchanged between the device **1000** and a server **1002**.

a. The user launches a system application, at a time indicated at **506**.
b. The client **206** sends an activation request message **508** to the server **1002**.
c. The server **1002** performs an authentication procedure **510** with the device. Upon successful authentication, the server **1002** assigns a subscriber identifier (ID) to the device. A device authentication key specific to the device is generated. This key is shared between the device and distribution servers for authentication of subsequent Device-to-Server transactions.
d. The server **1002** sends an activation response message **512** along with the subscriber ID, device authentication key, and an indicator that indicates to the device that the activation process was successful.

Upon successful activation, the device updates itself with the latest system information and requests other information, such as marketplace definitions, a program guide, and network parameters. At this point, the device is in the "activated" state and ready to subscribe to available services.

Device Subscriptions

FIG. **6** shows one embodiment of a message flow diagram **600** that illustrates how a device subscription process is provided in one embodiment of a subscription system. Once in the activated state, the device **1000** allows a user **1004** to subscribe to one or more service packages. During the subscription process the following messages are exchanged between the device **1000**, a server **1002**, and a license server **1006**.

a. The user selects one or more service packages for subscription from the user interface on the device **1000**, as shown at **610**.
b. The device **1000** sends a subscription request message **612** to the server **1002**. The subscription request includes a subscriber ID, and package ID(s). The device signs the subscription request message **612** using the device authentication key if the message requires a signature.
c. When the subscription request message **612** is received, the server **1002** authenticates it (at **614**) using the digital signature in the message. The server **1002** will also authorize the user.
d. The server **1002** sends a subscription response message **616** to the device **1000** with a success indicator if authentication and authorization are successful.
e. The device **1000** then requests (at **618**) an updated service license from the license server **1006**. The license server **1006** responds with a service license that contains the subscribed services.

Change in Subscription

FIG. **7** shows one embodiment of a message flow diagram **700** that illustrates how a device subscription is changed in one embodiment of a subscription system. The device user **1004** may change a subscription at any time while the device **1000** is in the "subscribed" state. The user **1004** can add or remove a service package using the user interface on the device **1000**. During the change subscription process the following messages are exchanged between the device **1000**, a server **1002**, and a license server **1006**.

a. The user initiates an un-subscription request **710** from the user interface on the device.
b. The device **1000** sends an un-subscription request message **712** to the server **1002**. The device **1000** signs the message using its device authentication key.
c. The server **1002** authenticates (at **714**) the un-subscription request message **712** using a digital signature in the message. The server **1002** will also authorize the un-subscription request.
d. The server **1002** sends an un-subscription response message **716** to the device **1000** with a success indicator.
e. The device **1000** requests (at **718**) an updated service license from the license server **1006**.

Unsubscribing from Services

As in subscription, device users can unsubscribe from one or more services or subscription packages. In one embodiment, a device user utilizes the subscription menu on the device to unsubscribe from services. For example, the subscription menu displays a list of installed services and the device user selects one or more services from that list which are to be uninstalled or unsubscribed. Once the device has successfully unsubscribed from a service, the device needs to free the resources associated with the services being unsubscribed. In one embodiment, the resource manager **216** operates to free resources associated with unsubscribed services and update the subscription database **214** to indicate that selected services have been unsubscribed. For example, the resource manager **216** may free memory resources when a service is unsubscribed.

Some subscription packages require prior subscription to a "root package." Generally, the user must first subscribe to the root package before subscribing to "add-on" packages. An add-on package is a subscription package that can be added after the user has successfully subscribed to the root package. The user is not generally allowed to unsubscribe from the root package if the device is subscribed to any add-on packages. In one embodiment, the system operates to allow the user the option of unsubscribing to all packages associated with a particular root package. This will unsubscribe the root and any add-on service packages. In one embodiment, the system operates to prevent the device user from unsubscribing any auto-subscribed packages. Once the user has successfully unsubscribed from a service or service package, any associated content is removed from the device.

Accordingly, while one or more embodiments of a subscription system have been illustrated and described herein, it will be appreciated that various changes can be made to the embodiments without departing from their spirit or essential characteristics. Therefore, the disclosures and descriptions herein are intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the following claims.

What is claimed is:

1. A method for subscribing to receive a subscription package of services at a device in a data network, the method comprising:

receiving, by the device, the subscription package and resource requirements associated with the subscription package, wherein:

the resource requirements indicate resources, comprising an amount of available memory, hardware resources, and software resources, required on the device to render the services associated with the subscription package to a user of the device,

the subscription package comprises a plurality of services offered on a subscription basis and each of the plurality of services comprises a sequence of media presentations delivered to the device for real-time playback, and

receiving, by the device, the subscription package and resource requirements associated with the subscription package comprises beginning an activation process to enable the device to receive the subscription package;

determining, by a resource manager on the device, whether the device meets the resource requirements associated with the subscription package by determining whether the device has each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package;

excluding from installation on the device one or more services of the subscription package in response to determining that the device does not have each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package, wherein the plurality of services of the subscription package are ranked based on a priority indicator associated with the each of the one or more services, and wherein a lowest ranked one or more services are excluded from the subscription package such that the device meets the requirements of all of the remaining non-excluded services associated with the subscription package; and

automatically subscribing the device to the subscription package by transmitting a subscription request for only the remaining non-excluded services of the subscription package to a distribution server over the data network.

2. The method of claim **1**, wherein said excluding comprises excluding services based on user input.

3. The method of claim **1**, further comprising outputting, by the resource manager, a notification that the selected resources fail to meet the resource requirements associated with the subscription package.

4. The method of claim **1**,

further comprising completing the activation process of the device to enable the device to install the subscription package including the remaining non-excluded services.

5. The method of claim **4**, further comprising rendering pre-activation content during the activation process.

6. The method of claim **1**, further comprising:

unsubscribing, by the resource manager, from one or more services associated with a subscription package; and

freeing resources associated with the one or more services.

7. A computing device, comprising:

a processor configured with processor-executable instructions to perform operations comprising:

receiving over a data network a subscription package of services and resource requirements associated with the subscription package, wherein:

the resource requirements indicate resources, comprising an amount of available memory, hardware resources, and software resources, required on the computing device to render the services associated with the subscription package to a user of the computing device,

the subscription package comprises a plurality of services offered on a subscription basis and each of the plurality of services comprises a sequence of media presentations delivered to the computing device for real-time playback, and

receiving the subscription package of services and resource requirements associated with the subscription package comprises beginning an activation process to enable the computing device to receive the subscription package;

determining, by a resource manager on the computing device, whether the computing device meets the resource requirements associated with the subscription package by determining whether the computing device has each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package;

excluding from installation on the computing device one or more services of the subscription package in response to determining that the computing device does not have each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package, wherein the plurality of services of the subscription package are ranked based on a priority indicator associated with the each of the one or more services, and wherein a lowest ranked one or more services are excluded from the subscription package such that the computing device meets the requirements of all of the remaining non-excluded services associated with the subscription package; and

automatically subscribing the computing device to the subscription package by transmitting a subscription

request for only the remaining non-excluded services of the subscription package to a distribution server over the data network.

8. The computing device of claim **7**, wherein the processor is configured with processor-executable instructions to perform operations such that said excluding comprises excluding services based on user input.

9. The computing device of claim **7**, wherein the processor is configured with processor-executable instructions to perform operations further comprising outputting, by the resource manager, a notification that the selected resources fail to meet the resource requirements associated with the subscription package.

10. The computing device of claim **7**, wherein the processor is configured with processor-executable instructions to perform operations further comprising completing the activation process of the computing device to enable the computing device to install the subscription package including the remaining non-excluded services.

11. The computing device of claim **10**, wherein the processor is configured with processor-executable instructions to perform operations further comprising rendering pre-activation content during the activation process.

12. The computing device of claim **7**, wherein the processor is configured with processor-executable instructions to perform operations further comprising:

unsubscribing, by the resource manager, from one or more services associated with a subscription package; and

freeing resources associated with the one or more services.

13. A non-transitory processor-readable storage medium having stored thereon processor-executable software instructions configured to cause a processor to perform operations for subscribing to receive a subscription package of services at a device in a data network, comprising:

receiving, by the device, the subscription package and resource requirements associated with the subscription package, wherein:

the resource requirements indicate resources, comprising an amount of available memory, hardware resources, and software resources, required on the device to render the services associated with the subscription package to a user of the device,

the subscription package comprises a plurality of services offered on a subscription basis and each of the plurality of services comprises a sequence of media presentations delivered to the device for real-time playback, and

receiving, by the device, the subscription package and resource requirements associated with the subscription package comprises beginning an activation process to enable the device to receive the subscription package;

determining, by a resource manager on the device, whether the device meets the resource requirements associated with the subscription package by determining whether the device has each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package;

excluding from installation on the device one or more services of the subscription package in response to determining that the device does not have each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package, wherein the plurality of services of the subscription package are ranked based on a priority indicator associated with the each of the one or more services, and wherein a lowest ranked one or more services are excluded from the subscription package such that the device meets the requirements of all of the remaining non-excluded services associated with the subscription package; and

automatically subscribing the device to the subscription package by transmitting a subscription request for only the remaining non-excluded services of the subscription package to a distribution server over the data network.

14. The non-transitory processor-readable storage medium of claim **13**, wherein the stored processor-executable software instructions are configured to cause a processor to perform operations such that said excluding comprises excluding services based on user input.

15. The non-transitory processor-readable storage medium of claim **13**, wherein the stored processor-executable software instructions are configured to cause a processor to perform operations further comprising outputting, by the resource manager, a notification that the selected resources fail to meet the resource requirements associated with the subscription package.

16. The non-transitory processor-readable storage medium of claim **13**, wherein the stored processor-executable software instructions are configured to cause a processor to perform operations further comprising completing the activation process of the device to enable the device to install the subscription package including the remaining non-excluded services.

17. The non-transitory processor-readable storage medium of claim **16**, wherein the stored processor-executable software instructions are configured to cause a processor to perform operations further comprising rendering pre-activation content during the activation process.

18. The non-transitory processor-readable storage medium of claim **13**, wherein the stored processor-executable software instructions are configured to cause a processor to perform operations further comprising:

unsubscribing, by the resource manager, from one or more services associated with a subscription package; and

freeing resources associated with the one or more services.

19. A computing device, comprising:

means for receiving over a data network a subscription package of services and resource requirements associated with the subscription package, wherein:

the resource requirements indicate resources, comprising an amount of available memory, hardware resources, and software resources, required on the computing device to render the services associated with the subscription package to a user of the computing device,

the subscription package comprises a plurality of services offered on a subscription basis and each of the plurality of services comprises a sequence of media presentations delivered to the computing device for real-time playback, and

means for receiving the subscription package and resource requirements associated with the subscription package comprises means for beginning an activation process to enable the computing device to receive the subscription package;

means for determining, by a resource manager on the computing device, whether the computing device meets the resource requirements associated with the subscription package by determining whether the computing device has each of the amount of available memory, the hard-

ware resources, and the software resources required to accommodate all of the services associated with the subscription package;

means for excluding from installation on the computing device one or more services of the subscription package in response to determining that the computing device does not have each of the amount of available memory, the hardware resources, and the software resources required to accommodate all of the services associated with the subscription package, wherein the plurality of services of the subscription package are ranked based on a priority indicator associated with the each of the one or more services, and wherein a lowest ranked one or more services are excluded from the subscription package such that the computing device meets the requirements of all of the remaining non-excluded services associated with the subscription package; and

means for automatically subscribing the computing device to the subscription package by transmitting a subscription request for only the remaining non-excluded services of the subscription package to a distribution server over the data network.

20. The computing device of claim **19**, wherein said means for excluding comprises means for excluding services based on user input.

21. The computing device of claim **19**, further comprising means for outputting, by the resource manager, a notification that the selected resources fail to meet the resource requirements associated with the subscription package.

22. The computing device of claim **19**, further comprising means for completing the activation process of the computing device to enable the computing device to install the subscription package including the remaining non-excluded services.

23. The computing device of claim **22**, further comprising means for rendering pre-activation content during the activation process.

24. The computing device of claim **19**, further comprising:

means for unsubscribing, by the resource manager, from one or more services associated with a subscription package; and

means for freeing resources associated with the one or more services.

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